

outwardly from the circuit layers as shown in FIG. 5 so that lamps 3-5 will be visible when activated.

A selected switch cell of membrane switch 45 of assembly 20 can be activated by an operator pressing downwardly along the top surface of second circuit layer 23 at the selected switch cell so that a contact 42 makes electrical contact with a contact 27 on the first circuit layer. The switch cells of the membrane switch 45 can be used to illuminate individual EL lamps 3-5 of the assembly by being connected to suitable control circuitry that in turn will actuate the electronics associated with the lamp panel or the switch cells can be connected to other external circuitry for activation independently of the EL lamps.

FIG. 7 illustrates a second embodiment 20a of a membrane switch-EL lamp panel combination according to the present invention. In assembly 20a, EL lamp panel 1 is attached to second circuit layer 23a instead of the first circuit layer as in assembly 20 of FIGS. 5 and 6 and layer 23a carries the circuitry to be associated with the lamp panel. The several elements of assembly 20a of FIG. 7 are the same as corresponding elements of the first embodiment and are identified by the same reference numeral followed by the suffix "a" in FIG. 7. Thus tail 32a extends from second circuit layer 23a.

FIG. 8 is a sectional view of a third embodiment of a membrane switch-EL lamp panel combination in accordance with the present invention. In assembly 20b, EL lamp panel 1 includes lead 10b along its lower surface and lead 15b along its upper surface. First circuit layer 21b and second circuit layer 23b each carry conductive circuits on their facing surfaces. Lead 15b will be in electrical contact with conductive pad 37b on the underside of second circuit layer 23b and lead 10b will be in contact with conductive pad 35b on the surface of first circuit layer 21b facing the EL panel 1. A tail 32b can extend from each of the circuit layers 21b and 23b in the assembly 20b if so desired. The transparent electrode(s) of the EL lamp panel 1 can be behind a window of layer 21b or 23b so that colored light will be visible through the window when the panel is activated or layer 21b or 23b can be transparent so that colored light from the panel will be visible. The construction of assembly 20b can facilitate connection of the assembly to certain types of equipment and illustrates that a combination switch-EL panel assembly of the present invention can be made in various configurations so as to be adaptable to many types of installation requirements.

In each of the preceding embodiments, the first circuit layer and second circuit layer can be made of any non-conductive flexible plastic film suitable for membrane switches. Polyester films, such as polyethylene terephthalate films, are the most commonly used materials. Also, however, polycarbonate films, polyimide films, nylon films and polysulfone films can be used, as well as others such as polyolefin and polyvinyl chloride films. The plastic film material selected for the circuit layers can be in the range of about 1 to 20 mils thick, or thicker if so desired, with 5 mil thick films being generally appropriate for most membrane switch applications. Further, the first and second circuit layers can be of the same plastic film material, or of dissimilar plastic film materials. The conductive circuits on the circuit layers can be printed with conductive inks, of which many types are well known in the art and commercially available, that may comprise a conductive metal such as silver, gold, copper, etc. in a suitable binder. Also, however, the conductive circuits can be applied to the sur-

faces of circuit layers by vacuum deposition of aluminum or other appropriate conductive metal onto the plastic film. In all respects, the membrane switch-EL panel assemblies 20, 20a and 20b described above can be produced by the manufacturing techniques typically used in the membrane switch art and with materials typically used in such art.

There has thus been described several embodiments of a new combination of an EL lamp panel and a membrane switch. The assemblies described above provide a combination of these elements which can be manufactured at lower cost than prior art assemblies incorporating membrane switch and EL lamp elements. Also, a compact package is provided with the assemblies of the present invention that is capable of being manufactured in various configurations, to thereby offer the potential of extending the use of membrane switches and EL panels in many types of equipment. The new constructions of the present invention also offer the opportunity to have electrical circuitry associated with the membrane switch and electrical circuitry associated with the EL lamp panel all brought out to a single tail for connection to external electronics, such as illustrated with assemblies 20 and 20a. This feature provides for simple and convenient connection of both a membrane switch and an EL lamp panel to external circuitry. Also, however, assemblies of this invention can include separate tails, with one tail carrying circuitry for the switch portion and the other tail carrying circuitry for the EL lamp portion, such as illustrated by assembly 20b above. This latter feature gives the switch designer a great deal of flexibility in providing the type of membrane switch-EL lamp construction that will be most appropriate for their particular piece of equipment.

The present invention has been described above by reference to certain specific embodiments. For example, the membrane switch portion of the exemplary assemblies is shown as including three switch cells; the membrane switch portion is to have at least one switch cell, but may have two or more or as many as required for a particular installation. The EL lamp panel is shown as including three individual EL lamps in the exemplary assemblies; the panel is to have at least one EL lamp but may have two or more or as many as required for a particular installation. It is to be understood that other changes to the described embodiments can be made by those of ordinary skill in the art that will remain within the spirit and scope of the present invention and all such changes are intended to be encompassed within the scope of the appended claims.

I claim:

1. A membrane switch-electroluminescent lamp panel assembly comprising, in combination:

- (1) a membrane switch comprising a first circuit layer and a second circuit layer spaced from one another, a conductive circuit including at least one contact on a surface of the first circuit layer and a conductive circuit including at least one contact on a surface of the second circuit layer, the circuit layers being arranged with their surface carrying the conductive circuits facing one another, conductive tracks leading from the conductive circuit on at least one of said circuit layers to the end of a tail portion extending from such circuit layer, said conductive circuits forming a membrane switch with at least one switch cell comprising spaced contacts;